AMENDMENTS

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (currently amended) A process heater for ~~high temperature~~ endothermic chemical reactions comprising:

an oxidation chamber, the oxidation chamber having an inlet for an oxidant, an outlet for combustion products, and a flow path between the inlet and the outlet;

a fuel conduit for transporting a fuel to the oxidation chamber, the fuel conduit containing a plurality of fuel nozzles along substantially the entire length of the oxidation chamber, each nozzle providing fluid communication from within the fuel conduit to the oxidation chamber, the fuel nozzles being spaced so that the fuel is added to the oxidation chamber at a rate that no flame results when the fuel is mixed with the oxidant flowing through the flow path in the oxidation chamber thereby producing flameless, distributed combustion throughout said oxidation chamber;

a preheater in fluid communication with the oxidation chamber inlet, the preheater capable of preheating said oxidant to a temperature at which when said oxidant and the fuel are mixed in said oxidation chamber, the temperature of said mixture of oxidant and fuel exceeds the autoignition temperature of said mixture; and

a process chamber in a heat exchange relationship with the oxidation chamber whereby a controllable heat flux is provided to the process chamber at a sufficiently high rate to complete the endothermic chemical process being conducted therein, and the heat transferred from the oxidation chamber to the process chamber does not cause the temperature of the mixture of the oxidant and the fuel within the oxidation chamber to decrease below the autoignition temperature of said mixture of the oxidant and the fuel in the oxidation chamber.

2. (previously presented) The process heater of claim 1 further comprising a coke inhibitor injection system, the coke inhibitor injection system being in fluid communication with the fuel conduit wherein an amount of coke inhibitor is supplied effective to inhibit coke formation at fuel conduit operating temperatures.

3. (previously presented) The process heater of claim 1 wherein the fuel conduit is a tubular conduit essentially centrally located within the oxidation chamber.

4. (previously presented) The process heater of claim 3 wherein the oxidation chamber is essentially centrally located within the process chamber.

5. (previously presented) The process heater of claim 1 wherein the process chamber is a pyrolysis reaction chamber for the thermal cracking of hydrocarbons in the production of olefins.

6. (previously presented) The process heater of claim 1 wherein the process chamber contains a catalyst and is used for steam methane reforming.

7. (previously presented) The process heater of claim 1 wherein the process chamber contains catalyst and is used for the production of styrene by the dehydrogenation of ethyl benzene.

8. (withdrawn) A method to provide heat to a process reaction, the method comprising the steps of:

providing a fuel;

adding to the fuel a coke inhibition component in an amount effective to inhibit coke formation at heater operating temperatures;

providing a oxidation reaction chamber, the oxidation reaction chamber having an inlet for oxidant, an outlet for combustion products, and a flow path between the inlet and the outlet;

transporting a fuel mixture to a plurality of fuel nozzles within the oxidation reaction chamber, with each nozzle along the flowpath between the inlet and the outlet;

preheating the oxidant to a temperature resulting in the combined oxidant and fuel from the fuel nozzle closest to the oxidation chamber inlet being greater than the autoignition temperature of the combined oxidant and fuel from the fuel nozzle closest to the oxidation chamber inlet; and

a process chamber in a heat exchange relationship to the oxidation reaction chamber wherein the heat transferred from the oxidation section does not causes the temperature of the mixture within the oxidation reaction chamber in the vicinity of each fuel nozzle to decrease below the auto ignition temperature of the combined mixture in the oxidation chamber in the vicinity of that fuel nozzle.

9. (withdrawn) The method of claim 8 wherein the process is a steam methane reforming process.

10. (withdrawn) The method of claim 8 wherein the process is an pyrolysis reaction for production of olefins.

11. (withdrawn) The method of claim 8 wherein the process is a ethylbenzene dehydrogenation process.

12. (withdrawn) The method of claim 8 wherein the coke inhibition component is selected from the group consisting of carbon dioxide and steam.

13. (canceled)

14. (previously presented) The process heater of claim 1 wherein the process chamber is used for the vacuum flash distillation of a feed.

15. (previously presented) The process heater of claim 1 wherein the process chamber is a hydrocarbon distillation column reboiler.

16. (currently amended) The process heater of claim [[13]] 1 wherein the endothermic chemical reaction is conducted in a single stage, and heat is provided to the process chamber by the oxidation chamber at a controlled temperature profile.

17. (previously presented) The process heater of claim 1 wherein the oxidant is preheated by heat exchange with effluent from the process chamber.

18. (currently amended) A flameless distributed combustion process heater for ~~high temperature~~ endothermic chemical reactions comprising:

an oxidation chamber, said oxidation chamber having an inlet for oxidant and an outlet for combustion products, and a flow path between said inlet and outlet;

a fuel conduit for transporting fuel into said oxidation chamber, said fuel conduit containing a plurality of fuel nozzles distributed along substantially the entire length of said oxidation chamber, said fuel nozzles being spaced so that the flow of said fuel through said fuel nozzles results in no flame when the fuel passes through the nozzles and is mixed with said oxidant flowing through said flow path in said oxidation chamber thereby producing flameless, distributed combustion throughout said oxidation chamber;

a preheater in fluid communication with said oxidation chamber, for preheating said oxidant to above a temperature at which when said oxidant and said fuel are mixed in said oxidation chamber, the temperature of said mixture of said oxidant and said fuel exceeds the autoignition temperature of said mixture; and

a process chamber in heat exchange relationship with said oxidation chamber, said plurality of nozzles distributed along substantially the entire length of said oxidation chamber being sized to provide the desired temperature distribution within said process chamber and the heat flux necessary to complete the endothermic chemical process being conducted therein.

19. (canceled)

20. (previously presented) The flameless distributed combustion process heater of claim 18 wherein the process chamber is a pyrolysis reaction chamber for the thermal cracking of hydrocarbons in the production of olefins.

21. (currently amended) The flameless distributed combustion process heater of claim [[19]] 18 wherein said endothermic chemical reaction is conducted in a single reaction stage at a controlled temperature profile.

22. (previously presented) The flameless distributed combustion process heater of claim 18 wherein said process chamber contains catalyst and the process conducted in said process chamber is the production of styrene by the dehydrogenation of ethyl benzene.

23. (previously presented) The flameless distributed combustion process heater of claim 18 wherein said process chamber contains catalyst and the process conducted in said process chamber is steam hydrocarbon reforming to convert a hydrocarbon and steam to hydrogen, carbon monoxide and carbon dioxide.

24. (previously presented) The flameless distributed combustion process heater of claim 18 wherein said oxidant is preheated by heat exchange with effluent from said process chamber.